THE

MYSORE GAZETE.

Published by Authority.

BANGALORE, SATURDAY, APRIL 12, 1879.

☞ Separate paging is given to this Part in order that it may be filed as a separate compilation.

PART IV.

Miscellaneous Papers.

No. 1.

Extract from the Proceedings of the Government of India, in the Department of Revenue, Agriculture and Commerce, dated Calcutta, the 28th February 1879.

(FIBRES AND SILK.)

Read the Resolution of the Government of India on the subject of the development of an industry in the silk of the tasar worm, No. 5—156-165, dated the 23rd November 1875.

Read the following papers containing such further information as has been gathered in connection with the production of tasar cocoons, and the processes of reeling and dyeing the silk in compliance with the request made in the foregoing Resolution :—

Letter from the Government of Madras, No. 662, dated the 13th February 1877, and enclosure.

Letters from the Government of Bombay, No. 113, dated the 11th January 1876, and enclosures, No. 1791, dated the 12th June 1877, and No. 1381, dated the 29th April 1878, and enclosure.

Letter from the Government of Bengal, No. 712, dated the 8th March 1877.

Letter to the Government of Bengal, No. 119, dated the 18th September 1878

Letter from the Chief Commissioner of Oudh, No. 1094, dated the 28th March 1876.

Letter from the Government of the North-Western Provinces and Oudh, No. 2746 A., dated the 27th November 1877, and enclosure.

Letters from the Government of the Punjab, No. 1287, dated the 6th November 1876, and enclosures, No. 266S., dated the 25th July 1877, and enclosure, and No. 488, dated the 20th April 1878, and enclosures.

Letters from the Chief Commissioner of the Central Provinces, No. 1185—49, dated the 29th March 1876, and No. 2417—98, dated the 28th June 1876, and enclosure.

Letter from the Chief Commissioner of British Burma, No. 320—14, dated the 28th October 1876.

Letter from the Chief Commissioner of Mysore, No. 9231—188G., dated the 23rd January 1878, and enclosures.

Letter from the Chief Commissioner of Assam, No. 256, dated the 9th February 1877.

Letter from the Resident at Hyderabad, No. 11, dated the 20th May 1876, and enclosures.

Read the following despatches from the Secretary of State, having reference to the experiments made under the instructions of Mr. T. Wardle of Leek, Staffordshire, with the tasar silk of India:—

No. 25 (Revenue), dated the 22nd March 1877, and enclosure.

No. 61 (Revenue), dated the 29th August 1878, and enclosures.

Read also two letters from M. Rondot, Delegate from the Chamber of Commerce of Lyons to the Paris Exhibition, and President of the Jury of Silk Industry, soliciting information connected with wild silks, including tasar, in India.

RESOLUTION.

In the Resolution of the 23rd November 1875, the Government of India stated the facts regarding the production of tasar silk so far as they were known to it, as well as the steps taken or under consideration in reference to the utilisation of this article and the development of a regular industry. The general conclusion which seemed to be justified by the information before it was that the domestication of the tasar worm offered no prospect of remuneration even if the process were in itself possible; but that if certain difficulties arising from natural conditions connected with the collection of the worm in its wild or in a semi-domesticated state could be overcome, and that if the silk could be satisfactorily reeled and dyed,—for difficulties had been encountered in connection with both processes,—a regular and extensive export trade from India to Europe, either in the shape of cocoons or as raw silk, would spring up; for it seemed certain that European manufacturers would take the raw produce if laid down at reasonable prices.

2. The first step to be taken, however, was to procure further information. It was obviously premature to take any measures having in view the creation of a regular industry without first obtaining definite information on important points on which information was wanting either wholly or in part. Such points were: the exact cost at which the raw material could be collected or produced in commercial quantities, both in the wild and semi-domesticated state; the cost of reeling the silk; the weight of silk in proportion to cocoon; the degree in which the filaments would bear *croissure*; and the consequent ultimate value of the silk in the market. As a first step towards the obtainment of such data, the Government of Bombay and the Chief Commissioner of the Central Provinces were requested to collect a quantity of cocoons in order that careful experiments might be made with them in this country, as also under the direction of Her Majesty's Secretary of State in some of the leading filatures in France and Italy. This was done, and the results of the experiments undertaken by Mr. Wardle under the direction of the Secretary of State

with the cocoons thus supplied are now before the Government of India and are stated in his reports attached to this Resolution. No experiments were made in this country, the gentlemen to whom cocoons were supplied for the purpose having pronounced them to be old and unfit for reeling, especially in this country, where the special machinery and appliances required for this purpose are not available. This is of little consequence, however, considering the success of the experiments in Europe, and having regard to the fact that in all probability filatures in India for tasar silk will not be required, and that only a trade in cocoons will prove remunerative.

3. At the same time that these cocoons were collected in the Central Provinces, the other Local Governments and Administrations were invited to make proposals and suggestions in the matter.

4. The result of the enquiries and experiments made in India has not on the whole advanced matters very far. In the Bombay Presidency the experiments undertaken by Major Coussmaker for the semi-domestication of the worm were interrupted by the drought and famine. They have since been renewed, but as yet with inconclusive results. These are stated in a letter from Major Coussmaker, from which the following paragraphs are extracted :—

* * * * * * * *

"2. My former experiments, as well as those conducted by Mr. Woodrow, had proved that it was a mistake to attempt to rear these worms on twigs, either those cut from road-side trees, or from those which had received some care and attention in a garden, and that the plan most likely to succeed was to feed them on shrubs in localities where they could be protected from their enemies, and, if need be, from unfavorable weather. With this view, I began to collect young plants.

"3. I had noticed in 1876 that the tasar worm throve well on *Lagerstræmia indica*, an ornamental shrub, fairly abundant in the cantonment of Poona; this is a plant which throws up a good many suckers during the monsoon, and I soon got a few plants together. I took a house which was well supplied with shade and water, and my gardener managed to collect 172 plants betweem December and July, many of them only a few inches high, but some were large enough to be of use. There were also in the ground six bushes, and my first care, when I came in from the districts, was to cut them all back to the hard wood, and apply to their roots a fair amount of manure. The consequence was that as soon as the rain commenced the plants shot most freely into leaf.

"4. Mr. Woodrow had not been able to save any seed cocoons, but I had found three female cocoons in the districts, and the Marathi woman, who had been my chief assistant in looking after these worms before, had collected twelve. I soon had several moths from these cocoons, and found, as I had noticed before, that there was no difficulty in getting an abundant supply of fertile eggs. Hardly any females were wasted; it was only necessary to put them out over-night on any bush, and it was almost a certainty to find them paired at daybreak. I found that it was not necessary to tether them; they rarely moved from the twig on which I placed them. As fast as the young worms hatched out, I put the trays containing them among the leaves of the plants and in a few hours they commenced feeding. The weather was everything I could desire, showery with a few breaks of fine weather; the bushes were full of young shoots, and the worms throve as I have never seen them thrive before. I tied bamboo screens together and covered over the plants as they stood in the open. The worms changed their skins at intervals of 4 to 5 days instead of 5 to 8, as had been the case when I reared them indoors on gathered food, and they spun their cocoons in 28 to 35 days instead of 40 to 50, as I had noted before. The moths came out of these cocoons in 27 to 30 days, and their eggs proved fertile, producing caterpillars which grew as fast and as large as the first. The only difference that I observed was that the 'cement' of the cocoons of the later crops was less uniformly white; this may have been due to the changes in the weather or the quality of the leaf, some shrubs having been eaten off three and four times this monsoon.

"5. The *Lagerstræmia* bush proved an excellent food; it flushed so quickly that a plant 2 feet high, after being fed off quite bare, cut back, and re-potted, was again in thick leaf in a fortnight, and the same batch of worms stripped it again. In changing the plants, and in daily examining the cages, a few accidents occurred; but 100 worms yielded 71 cocoons.

"6. I enclosed an old *Carissa carandas*, which had neither been pruned nor manured, with bamboo screens, and liberated 50 worms there. In the course of a month I gathered 31 cocoons, a little larger than those of the *Lagerstræmia*, but much harder and yellower. The caterpillars seemed to thrive a little better on this bush, and completely stripped it, but the tree did not recover quickly, and did not yield another supply of food the whole monsoon.

"7. I put six worms on to a young *Zizyphus jujuba* tree in my garden, but neither enclosed it, pruned it, nor manured it. It had a great deal of leaf and flower on it, and the worms ate both. They grew very large and healthy, being in every stage of their existence a little ahead of some of the same batch feeding on *Lagerstræmia*. Five cocoons were spun here, larger than any that I had gathered from off the other trees.

"8. I let the majority of the moths fly away, for as soon as the male has left her, the female is quite ready to go and look for suitable trees to deposit her eggs on. I had not enough food for more than 100 worms at a time in my own compound, and almost every attempt which I made at bringing them up elsewhere, unsheltered by the screens, failed. Crows, squirrels, and other enemies carried them off, and I hardly got a single cocoon; but in my own compound I continued to rear a few at a time, changing them from one tree to another as I found it expedient. The result of the experiments which I made shewed me plainly that plants in the ground with or without screens over them, gave the most suitable food; that it mattered not whether the young shoots were eaten down by the caterpillars or cut off by the pruning shears. The *Lagerstræmia* never sprouted again, and it was only the very limited supply of food which I had that prevented me rearing many more worms.

"9. From the single experiment I have mentioned, *Carissa* does not seem to recover quickly. *Zizyphus* seems to grow very fast, principally at the extremities of its long straggling branches; but as I only had one tree in my compound, I could not be sure about its usual habit of growth.

"10. I baked some of the cocoons gathered from each of these three trees and sent them home to Mr. Wardle, asking him to give me an opinion on the qualities of the respective fibres. I had all the burst and injured cocoons cleaned, and sent them, together with those which Mr. Woodrow had on hand, to the Alliance Mills in Bombay to be converted into yarn. I have kept some fifty seed cocoons for next year's experiments.

"11. I have got together a good many plants for next season's experiments—353 *Lagerstræmia indica*, 10 *Lagerstræmia parviflora*, 13 *Conocarpus latifolia*; plants and cuttings all rooted and in leaf: also 136 *Carissa carandas*, 135 *Zizyphus jujuba*, 105 *Pentaptera tomentosa*, seedlings. There are besides 3 *Zizyphus* bushes in the compound, and if my gardener will but take care of these during my eight months' absence from Poona, I hope to resume my experiments under better auspices.

"12. The past season has been very favorable for tasar worms. Mr. Lyle, who was cultivating them to a small extent at Dapuri in 1876, tells me that some of the men who were under him then came to him lately and asked him whether he wanted any more cocoons as they had seen several. He happened to be on the spot and sent a man to see how many he could collect within three hours. He came back with 300, and said that he had heard that some people had been taking them into Poona for sale, presumably to the native physicians. I myself have already found many more casually this year in the districts than I usually do."

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5. In Madras, in the North-Western Provinces and Oudh, in Burma, and in the Hyderabad Assigned Districts, as also in Mysore, there would seem at present to be no prospect of establishing any traffic in the cocoons or raw silk of the undomesticated worm.

6. The late Chief Commissioner of Assam thought that any attempt to foster the de in Sylhet would prove unsuccessful, and refrained from offering any suggestions

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beyond drawing attention to the existing and old-established silk industries of Assam, which in his opinion might have opened up a wide field for private enterprise were it not for the extraordinary delays that exist in communications between the province and the rest of India. Government have under consideration the question of improving the facilities for communicating with Upper Assam. It is hoped that when the contemplated improvement is effected, Colonel Keatinge's expectations will to some extent be realized; for there is at least as great a demand in the European markets for the cocoon of the eria and moonga worm as there is for that of the tasar.

7. In Bengal the tasar worm appears to abound in various localities generally, in all the tree and scrub jungle lying south and west of a line marking the southern and western limit of the continuous cultivation of the Gangetic alluvial and of the Orissa littoral. Whether the insect is of one or of several species, is a matter of doubt, and the season and mode of breeding and collecting appear to vary with the locality where it is found. The price of cocoons, it is alleged, ranges from Rs. 6 to Rs. 10 per kahan (1 kahan=16 pans of 80 cocoons each, *i. e.*, 1,280 cocoons); and in regard to its yield, one kahan makes in Bankurah two pairs of dhotis, in Sooree 15 chittacks of silk, and in the Southal Pergunnahs from 1½ to 2 seers. These and other more detailed particulars, furnished by the Government of Bengal, though admittedly incomplete and unauthenticated in some respects, are useful as far as they go, and the Government of India will be glad to be informed of the measures which are being taken to gather further particulars as well as of their results. The Lieutenant-Governor's opinion on the proposal made by Mr. J. Deveria, to the effect that the State should undertake the rearing of tasar cocoons in the jungle mahals of Chota Nagpore for sale to reelers and exporters is also awaited.

8. From the Punjab, some samples of tasar silk, reeled from cocoons produced in the Hoshiarpur district by the Deputy Commissioner, were reported on by the authorities whom the Government of India consulted as fairly successful. Some specimens of cloth, which were also received from Hoshiarpur, were found to have been very creditably manufactured.

9. The Secretary of State, in acknowledging in his despatch No. 25, dated the 22nd March 1877, the receipt of the cocoons gathered in the Central Provinces, has forwarded a report by Mr. T. Wardle, from which it appears that although the cocoons, when made over to the filatures in France and Italy, were found to be very old and imperfect, the reelers spoke most hopefully of the results that might be attained with fresher cocoons properly gathered and prepared. Mr. Wardle, too, said that he was prepared to dye tasar silk as reeled in Europe by his improved processes in almost any color, even to very pale shades.

10. The first part of a further report from Mr. Wardle has meanwhile been received under cover of the Secretary of State's despatch No. 61, dated the 29th August 1878; as also some samples of tasar silk displayed at the Paris Exhibition, as prepared under Mr. Wardle's instructions. These specimens, which can be seen at the office of this Department by persons interested in the matter, are far superior to anything ever yet seen of the same kind, the organzine especially being remarkable for its excellence. The grége is softer, cleaner, and altogether better than the best raw tasar silk as yet reeled. It is clear from these samples that such difficulties as existed in the reeling of this silk have been completely overcome. Mr. Wardle's process produces silk so fine as to be capable of adaptation to any purpose for which mulberry silk is used. Excellent results have also been obtained in the spinning of tasar thread and the weaving of fabrics from spun silk. Mr. Wardle's experiments with the dyeing of the silk have also been quite successful. On the whole it is certain now that there is no inherent obstacle to the utilization silk for manufacturing purposes.

11. The main question now to be answered is that of cost. Whether silk of this kind will be extensively consumed, depends upon the price at which it can be placed in the market. Mr. Wardle states that the cost of marking organzine and tram from the cocoons is 20 francs the kilogramme, *viz.*, 10 francs for reeling and 10 francs for throwing. This is double the price at which ordinary tasars are now sold, and it is not easy to say whether purchasers will be found for the improved product, greatly superior as it is, though it seems that the price is susceptible of reduction. As yet the only indication of the prices likely to be given for tasar silk is an offer made by M. David, a silk manufacturer of St. Etienne, who expresses his readiness to take one or two thousand kilogrammes of cocoons delivered at Marseilles at the price of one franc the kilogramme. This price, it is clear, is much too low, for according to the information before the Government, cocoons could not profitably be laid down in Europe at less than three or four times the sum mentioned. This, however, is a matter which admits of local verification, and it should form the subject of enquiry.

12. The results obtained by Mr. Wardle, as well as by others working independently, are so important and so full of promise as regards the manufacture of this silk and the utilization of the manufacture for apparel and other purposes, that it is eminently desirable to thoroughly investigate the question of production. Information on this subject has been sought from various quarters, but the information in the possession of Government is not sufficient to enable it to furnish precise answers, yet it is necessary, if the attention of capitalists is to be attracted to the development of this industry, that full information should be forthcoming. M. Natalis Rondot, a delegate from the Chamber of Commerce of Lyons to the Paris Exhibition, and President of the Jury in the Silk Section, has written to the Government of India, asking for information on the following points, not only as regards the tasar worm but also as regards other undomesticated worms:—

(1) an enumeration of the different kinds of wild worms ;
(2) the districts from which each kind is obtained, and in what quantities ;
(3) the species of worm from which each kind of silk is manufactured ;
(4) the trees on which the worms feed ;
(5) the uses to which the silk is put by the natives ;
(6) the markets where they are to be purchased ;
(7) the probable prices of dry cocoons of each kind and of the silk as reeled by the natives ;
(8) the probable quantities retained for local consumption and available for exportation to European silk mills ;
(9) and the out-turn in money value of the silks woven in India, which M. Rondot thinks must be considerable, especially if tasar and other similar silks commonly worn by the natives are taken into account.

13. M. David, of St. Etienne, also asks for information on the following points:—

(1) the nature of the chemical agent used by natives to soften the cocoon ;
(2) whether the natives can reel a cocoon more than a year old ;
(3) the length of time elapsing from the spinning of the cocoon and the emergence of the moth.
(4) whether the dark and light colored cocoons which are found mixed in the bales sent from India are of different varieties, and whether they are found in the same localities ;
(5) also, whether it would be possible to obtain bales containing only light colored cocoons.

14. Some information, but of a vague and general kind, exists on a good many of the points enumerated by M. Rondot, and the Governor General in Council desires that an effort may be made to cause such specific information as is obtainable with special reference the quantity obtainable and the prices on the spot, to be furnished with as little possible. It is also much to be desired that particulars of manufacture should be far as possible.

The particulars of the out-turn of the filatures in Bengal are unknown; for, though the quantities exported and their values are ascertainable, Government is unable to say how much of the out-turn of the filatures (there are a great many native filatures) is kept in the country, or what it is worth. Of the small local native reeling (small separately, but large in the aggregate), no more is known than of the handloom village weaving of cotton. In Assam and Burma, silk reeling and weaving are a domestic occupation of the women of the house; in other provinces it is a trade. In Bombay, there are two mills worked by steam in which silk is woven, but the extent of their operations is unknown. In short, no precise statistical account of the silk industry in India is extant, though there is a good deal of information of a more or less vague and general character. As regards silk production, Mr. Geoghegan's account of silk in India contains practically all the information that Government possesses, although for some years past much attention has been paid to the production of tasar silk. The same is to be said of the other kinds of wild silk. These are all separately distinguished and shewn in Mr. Geoghegan's book, in the section given to the wild silk producers, as well as in the appendix by Captain Hutton. Interesting information, though in most cases of a general character, has been furnished by the Local Governments and Administrations, but more precise information is now desirable, and the Government of India will be glad if the Government of Bengal and the Chief Commissioners of the Central Provinces and Assam will take measures to collect it, and furnish a report giving a categorical reply to the enquiries of both M. Rondot and M. David.

ORDER.—Ordered, that, for the purposes indicated above, a copy of the Resolution, of the despatch from the Secretary of State, No. 61, dated the 29th August 1878, and extracts from M. Rondot's letters, be forwarded to the Government of Bengal and to the Chief Commissioners of the Central Provinces and Assam; and also that they be forwarded to the Government of Bombay for communication to Major Coussmaker.

Ordered, that a copy of this Resolution, and of the despatch from the Secretary of State, No. 61, dated the 29th August 1878, be forwarded for information to the Governments and Administrations mentioned on the margin.

Madras.	British Burma.
North-Western Provinces and Oudh.	Mysore and Coorg.
Punjab.	Hyderabad.

Ordered, that this Resolution and the papers read in the preamble thereof be published for general information.

(True Extract)

C. L. TUPPER,
For Secretary to the Government of India.

From the Secretary of State for India, To the Government of India, No. 61 (*Revenue*), *dated* 29*th August* 1878.

Referring to my predecessor's despatch No. 25 of the 22nd March 1877, I now transmit, for Your Excellency's information, copies of the first part of a further report by Mr. Thomas Wardle on tasar silk and Indian dye-stuffs, and of a memorandum thereon by Dr. Birdwood, C. S. I., together with the samples of silk referred to in the report; and also copies of a letter from Mr. Wardle, of the 31st July last, and of its enclosure, relative to an offer by M. David, of St. Etienne, to purchase 2,000 kilogrammes of tasar cocoons for the purpose of making manufacturing experiments at his own cost.

2. With regard to this latter subject, Mr. Wardle has been informed that should be advised to procure the cocoons he requires in the ordinary course of some firm in Bombay or Calcutta. I desire, however, that the informat

wishes for, relative to the native method of dealing with tasar cocoons, &c., may be procured and transmitted to me at an early date for communication to him.

3. It seems impossible to attach too much importance to the improvements introduced by Mr. Wardle in the manufacture of this silk, the results of which may confidently be expected to open up a large field of enterprise for the supply of this article to the European markets, and to bring into more extended use one of the raw products of India for which there has hitherto been but a limited demand.

4. I shall address Your Excellency further on this subject upon receipt of the second part of Mr. Wardle's report.

Memorandum by DR. GEORGE BIRDWOOD, C. S. I., *dated* 10*th August* 1878, *on* MR. T. WARDLE'S *Report on Tasar Silk and Indian Dye-stuffs of* 1*st August* 1878.

It would be difficult to speak too highly of the patience, ability, and perseverance with which Mr. Wardle has carried out these experiments, or of the importance of the results obtained. These are, in brief, that he has succeeded in preparing Indian wild silk almost as fine as the finest Chinese silk, and in dyeing it almost any color.

Whereas 1,000 yards of Indian wild silk formerly weighed from 10 to 15 drachms, it can be now prepared of the weight of only 3 drachms and under, the same quantity of the finest Chinese silk weighing 2 drachms to 4 drachms. In dyeing this wild silk Mr. Wardle's success has hitherto been chiefly with the aniline dye series. The defect of these colors is that they are crude, flaring, and inharmonious, but a process has been suggested to Mr. Wardle by which it may be possible to dye silks and other stuffs with the aniline series in rich, deep and artistic tones. I would suggest that Mr. Wardle's paper should be communicated at once to the Government of India. The portion of the report still due from him, on the application of the native dye-stuffs of India to Indian wild silk and other woven fabrics, will be principally of artistic interest. The present report is of very pressing practical interest, as M. David's letter shews. For nearly 100 years the Indian Government went on endeavouring to increase the export of Indian silk by importing eggs from China and mulberry trees and expert labor from France and Italy and elsewhere, but all in vain. Even after the abolition of the Company's trading monopoly the same false and costly course was pursued, until in 1858 the attention of the Government of Bombay was officially drawn to the wild silk of the country, undoubtedly originally derived from China, and thoroughly acclimatised. Beyond ascertaining that wild silk was produced all over the Bombay Presidency, nothing was then done by Government. But Dr. MacKenzie and Captain Coussmaker and others continued to give great attention to the subject, and the result of their enthusiastic labors, combined with Mr. Wardle's long interest in their researches, has been to lead to the experiments now reported, which afford a substantial ground of hope that a staple may have at last been added to the export trade of India. In fact if the results of Mr. Wardle's experiments are confirmed, he will have succeeded in making Indian wild silk merchantable wherever silk is woven and worn.

As to M. David's letter, it may be submitted to the Government of India; but probably the better plan, in his own interest, would be for him to write to some firm in Bombay or Calcutta to send him direct the 2,000 kilogrammes of cocoons he wants.

When the second part of Mr. Wardle's report on the native dye-stuffs of India is re-ed, it might be desirable to make a comprehensive report on the whole subject of those ents.

MR. WARDLE'S *Report on Tasar Silk and Native Dye-stuffs of India.—(First Part).*
Dated Leek, 1st August 1878.

I have completed the first part of my examination, and have now the honor of laying the results before the Government of India.

Last winter I received a communication from Dr. Birdwood asking me to undertake the arrangement of exhibits of Indian silks and dye-stuffs in the India Section at the Paris Exhibition.

I have done so, and the results of those exhibits form the basis of this report, especially that part which relates to the tasar and other wild silks of India.

I have not had sufficient time to examine all the dye-stuffs of India which were sent to me. In a few months the examination will be completed and will form the substance of my second report.

In dealing with the tasar cocoons sent to me, I have endeavoured, with signal success, to improve the manufacture of this silk.

This has been accomplished to an extent that will greatly increase its importance in the silk industry of Europe, as well as making it much less unyielding in its resistance to tinctorial matters.

Much of the import of tasar silk is of such low and badly reeled quality as to be totally unfit for nearly all European textile work; and even where the quality happens to be better than it usually is, it is much too coarse in thread for any but the coarsest kind of work; consequently its use is and has always been extremely circumscribed.

I shall be able to shew that there is no longer any necessity for this, nor for any obstacles to be interposed for the extended use and cultivation of this silk, and that it promises to be as useful in degree as that of the mulberry worm.

I believe also that the same may be said for several other species of Indian wild silks.

Several of the samples to illustrate this accompany my report; the rest, including the dyed specimens, are under exhibition at Paris, but shall be described here.

I have given the samples now sent the same numbers as those in the Paris Exhibition case. The report will, therefore, correspond in numbering and explanation with the monograph I have written, and which is appended to the second edition of Dr. Birdwood's Handbook of the Indian Section.

Nos. 8 and 9 are samples of tasar, organzine, and tram, illustrative of the quality and state of manufacture such as is now used in England for weaving, and a good representation of the present state of its manufacture, which gives a size of 255 deniers (15 drachms per 1,000 yards). The sizes of tasar generally used in England run from 152 deniers (9 drachms) to 255 deniers (15 drachms). These are very coarse sizes, and must necessarily be unfit to produce such fine textile work as the mulberry silk, which can be and is manufactured into organzine and tram of 21 deniers and upwards (1¼ drachms), and from which are made the finest silk fabrics.

Nos. 13 to 17 are samples reeled for the market by the natives from the cocoons in various parts of India. They shew the more or less rude and imperfect states in which is prepared for the market and for native use.

I send them only to point out the contrast between them and the next sample, 17*a*, which shews what, under proper management, this fibre is capable of. This is raw tasar silk reeled from the cocoons I received from India.

In September 1876 I proceeded, with your permission, to Italy with some of the cocoons, to have my ideas of cocoon-reeling and throwing carried out (cocoon-reeling being a branch of silk industry not practised in England), and I am glad to report that I there met with the success I anticipated. The house which I employed to make the experiments, Messrs. Gaddum and Company, were so much impressed with the importance of the results as to say to me they would send out to India a person for the purpose of collecting tasar cocoons on their own account.

I have subsequently heard of their interesting themselves in this manufacture.

This sample, 17*a*, is raw silk as wound from the cocoon, the fibres of six cocoons being wound together, forming one thread ready to be thrown into organzine or tram in the usual way, and capable of yielding sizes of from 51 deniers upwards, *i. e.*, 3 drachms and upwards, per 1,000 yards.

In addition to this greater fineness of thread, as compared with that of the present tasar silk of commerce, you will notice an almost entire absence of lumps, technically called "foul slubs," which have hitherto prevented tasar silk being substituted for the mulberry silks.

So that instead of organzine and tram of 15 drachms to 9 drachms per 1,000 yards, you have before you the improved silk capable of yielding organzine and tram of 51 deniers, or 3 drachms per 1,000 yards skein, and this with a silk primarily so much thicker in fibre than the mulberry silks.

At the end of the report, I have added a table of microscopic measurements which I have made of the thickness of the primary fibres of the mulberry silks (China, India, Italy, France, Japan, and those of the tasar and other wild silks of India). From this it will be seen that tasar silk is from three to four times thicker in fibre than the mulberry silks.

Tasar silk possesses the greatest strength and tensile power, and it has as much lustre as any silk.

No. 19 is a sample of tasar organzine (51 deniers or three drachms per 1,000 yards) manufactured in Italy from the cocoons under my own instructions and superintendence. The improvement in quality, fineness, and cleanness will be seen to be most marked, and that, instead of the coarse sizes of tasar now used, of 152 to 255 deniers (9 to 15 drachms), there may be obtained by proper management organzine and tram of excellent quality from the same cocoons of 51 deniers (3 drachms) and upwards, which can be woven into a great variety of stuffs, for which until now only the mulberry silks have been available.

The attention of all interested in or connected with silk manufacture cannot be too strongly drawn to this fact, nor can its value be overrated.

There is a most important future in store for the tasar silk industry, and as great improvements will take place as those which resulted from the introduction of proper machinery and skill many years ago in the mulberry silk district of Bengal, when it was found that Bengal silks, in place of being then almost unworkable, could be manufactured in such a way as to bring them into extended use in Europe, so as even to rival French and Italian silks. The cost of making organzine and tram from the cocoons with the improved mode is 20 francs per kilogramme—10 francs for reeling and 10 francs for throwing.

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You will observe from the samples, and from what I have just stated, that the success in improving this manufacture is complete, and that tasar silk, when properly made, is ready to take its place in all the silk textile industries where extreme fineness is not required, such, for instance, as cloths of which a material is all tasar, or mixed cloth, with tasar weft, for trimmings, braids, elastic boot webs, where silk of 3 to 6 drachms is in constant use, also for the weft or shute of ribbons, the chief obstacle to its use hitherto for this last purpose having been its foulness (slubbiness). Now this imperfection is removed, there will be an extensive demand for it in the ribbon trade.

The difference between the ordinary tasar, selling with difficulty at 3*s*. to 4*s*. per lb., and the samples I submit is due to improved methods of manufacture, which I am ready to communicate to you, and even to teach to the native workmen if that course is thought more useful.

In the meantime, however, I would strongly urge that the greatest encouragement be given to the proper gathering and collecting of tasar cocoons and the exportation of them in a compressed state, and that encouragement be given to the planting and cultivation of the most suitable trees and plants which feed the tasar worm in the likely labor centres near good roads where the cost of carriage can be minimized.

The worm feeds on the following trees and plants :—

Rhizophora calceolaris Linn.
Terminalia alata glabra. (Assun tree.)
Terminalia tomentosa. (The Saj tree.)
Terminalia Catappa. (Country Almond tree.)
Tectona grandis. (Teak tree.)
Zizyphus jujuba. (Ber tree.)
Shorea robusta. (Sal tree.)
Bombax heptaphyllum. (Semul.)
Careya sphærica.
Pentaptera tomentosa.
Pentaptera glabra.
Recinus communis. (Castor Oil plant.)
Cassia lanceolata.

I am quite sure that a very largely increased production of cocoons will meet with a ready sale, especially in France and England. Even the unwindable and pierced cocoons and waste will have a ready market, since our spinners, as I shall shew further on, can utilize all such refuse, and make excellent yarns and cloths from them.

I may mention that I took the opportunity, whilst on the jury of the Paris Exihibition to draw the attention of M. Colcombet, a juror, and M. David, two of the largest manufacturers of ribbons in St. Etienne, to the improved tasar. After thoroughly inspecting it, they said that if the Government of India could enable them to obtain cocoons, or point out how they may be obtained at about one franc per kilogramme, they would buy all that India produced, so certain were they of finding a ready sale and extended use for this, in place of the more costly silks.

M. David has since written to me asking me to obtain 2,000 kilogrammes (4,400 lbs) of tasar cocoons for experiment. He says many uses may be found for well reeled tasar, the only important question is that of an economical means of doing so.

These economical means are at hand ; for in place of the ordinary mode of reeling and throwing silk from the tasar cocoons into organzine and tram, which costs about 35 f

per kilogramme, or 12*s.* 8*d.* per lb., it can be done by the improved mode at about 20 francs per kilogramme, or 7*s.* 3*d.* per lb., and this cost will be decreased when the cocoons are properly collected and the industry better regulated.

Not less important than manufacturing is the dyeing of tasar silk, in the investigation of which I have been so long engaged.

I am happy to be able to report that the dyeing of this silk can now be successfully accomplished in all shades of color.

The results I have exhibited at Paris in three grades. The first consists of organzine and tram of the same coarse quality as at present used in England for weaving into self-colored dress pieces, dyed in a variety of reds, blues, greens, yellows, and tertiary colors, with the dye-stuffs native to India, and with which I was furnished by the Government of India for examination.

An exposure of upwards of two months to the sunshine of Paris has only very slightly affected them, although placed in a position exposed to the direct rays of the morning and mid-day sun. The colors are not of the vivid intensity and crudeness of those produced by the aniline dyes, but they possess more tone and are fitter for all purposes of true decorative art, and possess much more permanency: but on those points I hope to treat more definitely when I have the honor of presenting my report on the dye-stuffs of India, and their applicability to tasar silk, at present under examination.

By the advice of Dr. Birdwood, I also exhibit tasar silk dyed with ordinary aniline dyes, in order to shew what could be done on it with these dyes, which in Europe have almost replaced the better and faster materials. I have therefore dyed two grades of tasar organzine in a variety of delicate shades of aniline dyes—one, the second, is the improved organzine, the third is ordinary tasar organzine of good quality.

In dyeing the *improved* organzine, a very important fact appears. The silk takes the dyes with less difficulty. I have no doubt that one of the main reasons why the natives cannot dye tasar silk will be in the fact that the methods of their rude manufacture partly destroy whatever affinity suck silk has for tinctorial impregnation.

It is not unlikely that before tasar silk can be really well dyed in India, a considerable improvement must be effected in all the manufacturing operations, even from the time the cocoon becomes completed.

It would, perhaps, be hardly within the scope of this Report to go into the chemical reasons for this opinion, but they are no less important than real.

I have also to report similar success in applying printed colors upon tasar silk cloths, samples of which I send with the Report Nos. 21 and 25. It is, as far as I am aware, the first time any attempt has been made, either in Europe or in the East, to print, on wild silk cloth of any kind.

So that now printed tasar silk can be successfully used for wall damasks, curtains, furniture coverings, hangings, women's and girls' dresses, with great effect, and I would draw the attention of upholsterers and broad silk manufacturers to these specimens, and especially three under No. 55 of twill silk, made of this material from the warp and weft of Nos. 8 and 9, 255 deniers.

The fabrics made of tasar silk are very strong, most durable, and possess much lustre. ·tterns printed in blue are the first successful application of indigo on silk as a print, s a pencil blue as formerly.

The tone of blue is very rich, modified to some extent by the natural ground color of the silk (which is fortunately incapable of being made vividly white), and has consequently controlled too great a brightness.

They will prove remarkably fast; in fact none of the colors are printed in aniline or any other fugitive dyes.

These fabrics are woven with organzine and tram of the coarse native-reeled and English-thrown tasar of 15 drachms per 1,000 yards, and are not really such good examples of what can be done in printing on fabrics of improved manufacture, samples of which I hope before long to submit to you, but they effectively serve the purpose of shewing that now a great variety of colors can be applied to tasar silk fabrics in printing as well as in dyeing, and I cannot conceive of any more beautiful application of them than to the walls of rooms after the manner of damask, if well designed.

I come now to treat of spinning tasar silk. This is effected after the manner of spinning cotton, wool, flax or any other short fibre that cannot be wound off in a continuous thread.

Since the important improvements which have been made in England of late years in silk spinning machinery, a new and large industry has sprung up whereby all refuse silk and unwindable cocoons of the mulberry silk manufacture are submitted to the operations of carding, combing, and spinning, and threads of beautiful regularity and silkiness are made.

I have exhibited a series to shew to what uses the waste of tasar silk and the cocoons pierced by the exit of the moth can be put after being spun in this way.

There are probably not less than forty firms in England engaged in this operation, and many more in Switzerland, France, and Italy, but it is only recently that tasar waste silk has attracted notice, and large quantities have been a drug in the market for a long time. They have been bought up, and have been spun and woven into fabrics for upholstery and dresses of surprising perfection and interest, and a demand which cannot be fully supplied has arisen for a further supply.

I send sample No. 56*a* which I have had spun and woven from unwindable cocoons out of those I received from India; also five samples, No. 57, made of tasar waste and printed in colors.

Also samples of yarns spun from tasar waste for weaving, sewing and knitting stockings.

Probably of not less importance in the future are the other wild silks of India, particularly that of the Arrindi or Eria worm of Assam, known under the following names:—

Phalæna Cynthia, (Roxburgh).
Bombyx Cynthia, (Oliver).
Samia Cynthia, (Hübner.).
Saturnia Cynthia, (Westwood).
Saturnia Arrundi, (Royle).
The Arrindi or Arrundi silk-worm moth (Roxburgh).

With this I must connect the *Attacus ricini* (Boisduval), the same insect, as far as I can gather, except that it is fed on the *Ricinus communis*, or Palma Christi plant, and is reared in a domesticated state in Assam, and over a great part of Hindustan, more espe- in the districts of Dinagepur and Rangpur.

Mr. Hugon gives the following interesting particulars about it :—"The larva, when at full size, is about 3½ inches long. It spins its cocoon in four days. The hill tribes settled in the plains are fond of eating the chrysalis."

The cocoon is much smaller than that of the tasar, and is soft. The natives cannot wind the silk, but spin it like cotton. Dr. Helfer says that the insect is so productive as to give sometimes twelve broods a year, and that the worm grows rapidly, and offers no difficulty whatever for an extensive speculation.

Mr. Atkinson says the filament is so delicate as to render it impracticable to wind off the silk; it is therefore spun like cotton. The yarn thus manufactured is woven into a coarse kind of white cloth, of a seemingly loose texture, but of incredible durability, the life of one person being seldom sufficient to wear out a garment made of it.

The winding of the Eria cocoon is said to have been recently accomplished. The thickness of the Eria filament is 1—3800 of an inch.

Leaving the question as to whether it be successfully wound or not, one important consideration respecting its use presents itself, namely, its capability of being spun like cotton or wool. The great improvements made in late years in England in spinning machinery have proved that marvellous results in making an even thread from waste silk and unwindable cocoons for sewing and weaving purposes may be attained, and I will venture to predict a future for this and the produce of all unwindable silk-worm cocoons that will compensate for collection.

The industry of the natives should be stimulated to the gathering in of all kinds of wild silk cocoons, whether windable or not, for there is no doubt that those kinds which cannot be wound can be most easily spun, and there is at the present moment a request on the part of silk spinners for a larger supply of tasar silk cocoons and tasar silk waste for spinning purposes, and no doubt other silk cocoons would be gladly bought up.

A worm so prolific and yielding such exceedingly fine silk gives a large promise of future supply to the spinner. I should be glad to have your authority for a further and thorough effort to make silk marketable in Europe.

Besides the Eria worm there are also the following which furnish good silk cocoons, all of which I have exhibited in Paris :—

The *Attacus Atlas.*

The Mooga or Moonga silk (*Antheræa Assama*) giving five broods a year. I send a sample of this silk, No. 35. It promises to be useful silk under proper care.

The *Bombyx Attacus*, "Yama mai," a native of Japan, but found in India. In Japan the silk of this worm is said to be most highly prized, and reserved for the use of royalty, but this I am inclined to doubt, as the silk is of a coarseish character. This I was assured by the Japanese at the Paris Exhibition is not now the case; they shewed me several highly interesting fabrics made with it. The cocoon is of a beautiful pale green color and is easily wound. It has been reared in Europe, and a cross between it and *Bombyx Attacus pernyi* is a success in France, being so hardy that the eggs will hatch at freezing point. A successfully encouraged cultivation of it in India would make a valuable addition to our Eastern sericulture.

The thickness of the fibre is 1—950 part of an inch, being a little finer than tasar silk. [illegible] also very much whiter in color, which is an advantage for dyeing.

[illegible] addition to these are the following :—A silk called "Ya baine," from Prome, in [illegible] silk from Assam (*Bombyx textor*); Mezankuri silk, rare; *Actias Selene.*

In Simla, Balfour states there are eight or nine species of *Bombyx*, probably all silk-producers.

I plead for the utilization and extended cultivation of all these wild silks, particularly the Tasar, Mooga, Eria, and Yama mai.

The difficulties of manufacturing, dyeing, and printing are, I am thankful to report, overcome.

It only remains for the Government of India, if I may presume to urge it, to give that encouragement and constant support to the increased production of the wild silk industry of India, and not to the wild silk only, but also to the mulberry silk, that has for centuries been accorded by Sovereigns and Statesmen in France to the permanent establishment and encouragement of the silk trade in that country, to make India a chief exporter of raw material, as France now is of the manufactured products.

The following table contains the series of microscopic measurements to which I referred in the earlier part of this report:—

Microscopic measurements of the diameter of the primary Fibre of Tusar Silk and other Silks.

Names of Silks or Worms producing them.		Country.	Food of larva.	Measurements of the diameter of the primary Fibre.			
				French metric scale.		English scale.	
Scientific names.	Vernacular names.			Loose silk on outside of cocoons.	Silk forming substance of cocoons.	Loose silk on outside of cocoons.	Silk forming substance of cocoons
				Mm.	L Mm.	Inch.	Inch.
Bombyx mori ...	...	China ...	Mulberry ...	...	·0125	...	$\frac{1}{2000}$
,, ,, ...	...	Japan ...	,, ...	...	·0135	...	$\frac{1}{1850}$
,, ,, white ...	...	Bengal ...	,, ...	...	·006	...	$\frac{1}{3750}$
,, ,, yellow ...	...	,, ...	,, ...	...	·0083	...	$\frac{1}{3000}$
,, ,, ...	Brutia ...	Bruitia, Asia Minor.	,, ...	...	·0115	...	$\frac{1}{2150}$
,, ,, ...	Ya-baine ...	Bengal ...	,, ...	...	·01	...	$\frac{1}{2500}$
,, ,, ...	...	Italy ...	,, ...	...	·0108	...	$\frac{1}{2300}$
,, ,, ...	...	France ...	,, ...	...	·0135	...	$\frac{1}{1850}$
,, texta ...	"Pat" silk ...	Assam ...	,, ...	...	·01	...	$\frac{1}{2500}$
Attacus ricini ...	Eria, Ailanthus...	India ...	Ricinus communis, Castor oil plant	·016	·006	$\frac{1}{1500}$	$\frac{1}{3750}$
Antheræa Assama ...	Mugah or Moonga	Assam ...	Soom and Sonhaloo trees ...	·0135	·01	$\frac{1}{1850}$	$\frac{1}{2500}$
	Aistari Polu koa.	Beerbhoom (Bengal).	...	·01	·006	$\frac{1}{2500}$	$\frac{1}{3750}$
Antheræa Paphia ...	Tusser or Tasar.	India ...	Terminalias and other plants ...	None.	·03125	None.	$\frac{1}{800}$
Bombyx ...	Mezankuri silk (rare). ...	Sibsagar(Assam).	Mulberry ...	...	·01	...	$\frac{1}{2500}$
Actias Selene ...	...	India ...	Coriaria Nipalensis ...	·03	·02	$\frac{1}{750}$	[illegible]
Attacus Atlas ...	...	...	Phyllanthus emblica ..	·03	·02	$\frac{1}{850}$	
Bombyx Attacus ...	Yama mai ...	India ...	The oak ...	·025	·026	$\frac{1}{10}$	
,, ,, Pernyi...	...	China ...	,, ,, ...	...	·025		

From MR. WARDLE, *To the Under-Secretary of State for India, dated Leek, 31st July* 1878.

Since writing my report I have received from M. David, who I am told is the largest silk manufacturer at St. Etienne, an order for 2,000 kilogrammes of tasar cocoons, for the purpose of making manufacturing experiments with this silk at his own cost.

I enclose a translated copy of part of his letter.

Will you have the kindness to inform me if the Government of India will authorize the collection of the cocoons, and supply them to M. David with the information he desires?

I have no opportunity of obtaining them for him.

Copy of a letter from M. DAVID, *of St. Etienne*, to MR. WARDLE.

I offer to buy one to two thousand kilogrammes tasar cocoons delivered at Marseilles at one franc per kilogramme; these cocoons to be of the year's crop and well killed, not pierced. Kindly impress on your Bombay friends to kill the worms in the cocoons well. In case the moths come out on the road, the cocoons will be useless. A friend of mine has just received a bale of these cocoons and the moths came out of them at Marseilles.

In order to facilitate the reeling in France, kindly give me the following information:—

1st.—What is the chemical agent made use of by the natives to soften the cocoon and make it ready for reeling?

2nd.—Can the natives reel a cocoon more than a year old?

3rd.—What is the length of time elapsing from the making of the cocoon and the time of the coming out of the moth: does not that time vary greatly?

4th.—The cocoons in the bales are mixed in color, dark and light: are these different varieties, and are they found on the same spots? Would it be possible to get only light colored ones?

I shall be thankful for answers to the above questions, which will facilitate my task.

Many uses may be found for well reeled tasar. The only important question at present is that of an economical means of so doing.

Mysore Government Press, Bangalore,—1879.